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## **BS 8001 and the built environment: a review and critique**

Francesco Pomponi <sup>1</sup>, Alice Moncaster <sup>2</sup>

<sup>1</sup> Resource Efficient Built Environment Lab (REBEL) Edinburgh Napier University, UK – Corresponding Author: [f.pomponi@napier.ac.uk](mailto:f.pomponi@napier.ac.uk)

<sup>2</sup> The Open University, UK

### **Abstract**

The BSI has recently published the world's first standard on the Circular Economy. The standard is intentionally broad and inclusive to suit all types of organisations and products. However, when it comes to complex products such as buildings – with large numbers of stakeholders, long lifespans, high uncertainties about future scenarios, and formed of multiple products interacting both temporally and geographically – there is a question as to whether BS 8001's inclusiveness and breadth are best suited to promoting real change.

This briefing paper presents a review and a critique of BS 8001 from the perspective of buildings. The paper demonstrates that the standard collates much of the existing information on the circular economy in a commendably comprehensive document. However while it offers a useful resource for the novice, within the context of buildings the standard does not deal with their complexity. It therefore falls short of identifying effective approaches to reduce the environmental impacts and waste streams caused by buildings, and thus misses the opportunity to accelerate the transition to a 'circular' built environment. A final section offers some additional documents and resources that could be helpful to those wishing to adopt the circular economy principles within the built environment.

**Keywords:** circular economy; buildings; built environment; BS 8001.

### **1. Introduction**

BS8001 is the world's first standard on the circular economy. This is certainly a positive move by the British Standards Institute, and it clearly places Britain in a strong position to lead the field.

Meanwhile the built environment is one of the greatest consumers of energy and finite natural resources, as well as one of the largest generators of carbon emissions and waste (WEF, 2016, EC, 2011, EEA, 2012). Its pivotal role towards a society based on the principles of the circular economy is therefore indisputable.

However, buildings are complex products, which do not follow the logic of standard and mass manufacturing, and need a tailored approach to enable 'circularity' (Pomponi and Moncaster, 2017). Therefore when the BS8001 (BSI, 2017) was first announced it felt appropriate, as active researchers in the field of circular economy and with construction

industry backgrounds, to review how the new standard would support the essential transition to a circular economy within the built environment.

This briefing article reviews the standard - its principles, framework, guidance and business models - considering buildings and the built environment at the centre of the analysis. In doing so we suggest areas where the standard could be improved, and identify a number of available resources that would complement the current generalist approach, in order to better enable the move to a circular economy in the built environment.

## **2. The world's first circular economy standard**

The standard consists of three main elements: principles, framework, and guidance, which are dealt with in turn.

### *2.1 Principles*

Six principles of the circular economy are identified and introduced within this section of the standard, and each is discussed in turn below in relation to the construction and operation of buildings. The six principles offered are: Systems thinking, Innovation, Stewardship, Collaboration, Value optimisation, and Transparency.

*Systems thinking* was recognised as a relatively advanced science by early circular economy advocates (Webster, 2013). There is a demonstrated potential for Systems Thinking to effect change in the construction industry (Emes et al., 2012, Blockley and Godfrey, 2000) and help stakeholders deal with building complexity and future uncertainties. However, such positive change is yet to be seen on a large-enough scale, and it is likely that some of the key elements will be difficult to transfer to a building context, due to the multiple stakeholders and owners, as well as the extended lifespan and high uncertainty of future scenarios, that characterise a built asset, as is clear from Figure 9 (BSI, 2017, p.28).

*Innovation* – aimed at value creation through the sustainable management of resources, as the standard defines it – has been dealt with by a wealth of supply chain management research at various levels (Zairi, 1998, McElroy, 2003, Pretty, 2003, e.g. Mahoney, 1995). It could be argued that the very definition of the principle is tautological, simply defining the necessary condition through which companies can survive in a competitive, capitalistic market (Audretsch, 1995). There is also evidence of a clash between the current theory of construction and innovation theory (Koskela and Vrijhoef, 2001). It therefore seems that, at best, the construction industry can represent a ‘special case’ of innovation (Hwang and Shan, 2018)

*Stewardship* is a principle which shows much in common with Corporate Social Responsibility (CSR) (McWilliams, 2000). Both point towards an understanding, and the consequent management, of impacts occurring within the wider system in which a company operates. BS8001 defines stewardship as the responsibility of an organisation “for the management of all facets of its decisions and activities, from inception through to fulfilment and end of life” (BSI, 2017, p.29). For a building the problem comes in identifying the organisation. The multiple stakeholders involved in the building design,

manufacture and construction are highly unlikely to still be involved by the end of life. The clients for the construction of the building are frequently different to the owners and the occupiers, through the lifetime of the building. It is difficult therefore to see how such a disparate 'organisation' can fulfil this particular principle.

The fourth principle, *Collaboration*, has been long recognised as the crucial element to a company's triple bottom line performance (e.g. Elkington, 1997). The science behind collaboration is also quite advanced (e.g. Cao and Zhang, 2011, Holweg et al., 2005), though the construction industry still struggles to benefit from it (Akintoye et al., 2000). It has been suggested for an equally long time (Egan, 1998, Egan, 2002, Latham, 1994) that problems with collaboration in construction stem from both the complexity of buildings, and the many intertwined actors that each project involves. Collaboration is discussed again in Section 7.3 of the standard from an anti-trust perspective, warning that collaboration needs to happen lawfully. However the standard misses the opportunity to discuss the issue of horizontal collaboration between actors at the same level of the supply chain (Palmer et al., 2012, Rossi, 2012, Pomponi et al., 2015), which would be of particular relevance to the construction industry.

The '*Value optimisation*' principle proposes that companies "keep all products, components and materials at their highest value and utility at all times" (BSI, 2017, p.30) and that they reconsider what might be waste or a system loss to identify new opportunities and realise new potential (BSI, 2017). This too could be seen as problematic for buildings, partly because their highest value is often the land they sit on rather than their material form. An example is a Real Estate Investment Trust (REIT) owner of a functional 10-storey building in central London, who decides to optimise the asset by replacing the current building with a high-end 20-storey development. The standard might cluster this under the 'new revenue stream' – but it is difficult to argue that this would conform to the real principles behind the circular economy. Additionally, if the new high-end 20 storey development were to be managed by the REIT according to BS8001 it would quickly show the limit of the standard in factoring in the systemic nature of the building sectors where no actor can truly achieve a 'circular' built asset on its own.

The final principle, *Transparency*, is similar to Stewardship in that it is a crucial condition for Corporate Social Responsibility (Dubbink et al., 2008). As with Stewardship, the high numbers of stakeholders involved in a building throughout its life makes this principle, although valuable, a difficult one to enact.

The proposed six principles for the circular economy are clearly good practice for any business. However while their collective implementation might help companies move towards circularity, there are clearly problems in their interpretation and implementation for firms operating in the construction sector.

## 2.2 Flexible Framework

The *Flexible Framework* is perhaps the most valuable element in the standard. It is an eight-stage support tool which poses eight strategic questions to a business and, depending on the answers, points towards appropriate phases and actions to promote circularity. The earlier stages of Framing (Stage 1), Scoping (Stage 2), and Idea

generation (Stage 3) appear appropriate for discussion in a built environment context. The following stages, however, are rather harder to relate to the construction sector. For instance, Stage 4 (Feasibility) assesses the practicality of progressing the prioritised ideas and options. The feasibility of solutions applied to buildings often involves actors in the future whose identity is still unknown in the present. This significantly hinders therefore the feasibility of building-related circular solutions. The following stages are Business Case (Stage 5), Piloting and prototyping (Stage 6), Delivery and implementation (Stage 7), and Monitor, review and report (Stage 8). All suffer from the same criticality related to a building's complexity and lifespan, as well as from the significant resources that are generally needed to carry out such activities in a building context.

### *2.3 Guidance*

Finally the guidance in the standard refers to enabling mechanisms and business models. To be compliant with the standard, a selected business model and its value proposition must be underpinned by the principles of the circular economy (Section 2.1) and the flexible framework (Section 2.2). Therefore the limitations identified in the previous two sections are also extended to the guidance.

The focus of this standard is on short-lived products with a controllable manufacturing cycle and location, as is evidenced by most of the examples offered in this section such as digital space, reverse logistics, 3D printing, crowd-funding, refill service for ink cartridges, etc. (BSI, 2017, p.43-45). Some of these strategies are however able to help promote circular economy in construction, such as 3D printing (Hager et al., 2016, Guardian, 2017) and reverse logistics (Nunes et al., 2009) but there is still limited evidence of their wide adoption in the built environment.

Buildings do however get mentioned in this section under the business model 'Product life-extension' which offers the example of a building specification with an extended design-life. However, the example is of little use in practice since most buildings in the UK and worldwide are demolished for non-technical reasons such as increasing financial profitability from the site (as in the example offered in Section 2.1). Extending the design life of a built asset, while appearing rational, may have little impact on the realised life.

## **3. Complementary material for circular economy in the built environment**

The previous two sections acknowledge the importance of the BS8001 standard as the first of its kind, which will undoubtedly add to the body of knowledge around the circular economy. However this briefing paper suggests that it will have limited application to the built environment in its current form. This section offers additional documents and resources that could be helpful to those who wish to adopt the BS8001 in the construction sector.

In April 2016 the Ellen MacArthur Foundation published a collection of case studies for the built environment, with contributions gathered from within the pool of the CE100 companies (EMF, 2016). The document collects 12 case studies where (parts of) the Re-SOLVE framework (EMF, 2015) is applied to each one of them showing which strategies

and course of action were chosen to promote circularity in different contexts, projects and building types.

In September 2016 Arup, as a global Knowledge Partner of the Ellen MacArthur Foundation, released a document on 'The Circular Economy in the Built Environment' (ARUP, 2016). The document reports on the US\$100bn potential of the circular economy in the construction industry estimated by the World Economic Forum, and suggests that the greatest potential sits with materials and waste in UK constructions. The document again introduces the Re-SOLVE framework of the Ellen MacArthur Foundation (EMF, 2015) through examples which are specific to buildings and the construction sector, thus identifying strategies and enabling mechanisms that could be immediately put into action in the built environment. The Arup document also revisits the concept of the shearing layers of buildings first proposed in 1994 by Frank Duffy and Stewart (Brand, 1994), mapping a '7S' model against the Re-SOLVE framework. This allows different stakeholders in the life of a built asset to identify their 'area of influence/competence' and understand what strategies are pursuable to promote circularity. The potential of the concept of shearing layers to help frame the circular economy in the built environment was also identified by academic research (Pomponi and Moncaster, 2017).

Included as one of the Ellen MacArthur foundation case studies (EMF, 2016) is the EU funded project Buildings as Materials Banks (BAMB, 2017). An ongoing project, this actively engages with many stakeholders through frequent emails, web content updates, and annual networking and outreach events. Outputs have been primarily published at the recent conference on Advances in Recycling and Management of Construction and Demolition Waste held at the Delft University of Technology in June 2017. These papers cover a wide range of topics and issues, including (amongst others): business models for material circularity (Wang et al., 2017); the issues of the currently linear approach to the end of life of buildings in life cycle assessment (Lowres and Hobbs, 2017); opportunities and barriers to the implementation of circular solutions (Debacker et al., 2017); and the support that current policies offer to transition towards a circular economy in the built environment (Henrotay et al., 2017).

Finally, an excellent resource is offered by a special issue on the circular economy published recently in the Journal of Industrial Ecology (Bocken et al., 2017). Though not focused on the built environment specifically, it provides a global overview of the state-of-the-art of research and practice on the topic, with many trans-sectoral concepts and applications that could serve well as a starting point in the built environment.

#### **4. Conclusions**

The BS8001 is the world's first standard on the circular economy. This is certainly positive as it promotes the importance of the topic and contributes to a wider dissemination of the concept and its underlying principles. The standard however falls short of addressing properly the role that the built environment, as one of the greatest consumers of energy and finite resources and the largest contributor to carbon emissions and waste, has to play as an intrinsic part of a circular economy. This briefing article has critically reviewed the standard, identifying areas where the support offered to the built environment practitioners is limited. This article also complements the lack

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of information by pointing at additional recent resources which have relevance for buildings and the built environment. It is hoped that this briefing article will represent a useful critical resource by readers of the new BS standard from within the construction sector, to ensure a more comprehensive overview of the challenges and opportunities that lie ahead on the path to a 'circular' built environment.

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